

## SOIL REFERENCE

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### Soil Manganese ( $\text{Mn}^{++}$ )

Manganese is an essential element for plant growth and plays a key role in photosynthesis and other critical pathways in the plant. Manganese can substitute for magnesium in some reactions in the plant.

#### The role of manganese in IPM

Manganese has been found to suppress take-all patch caused by *Gaeumannomyces graminis* on bentgrass. Target levels of manganese are dependent upon soil pH and can be calculated using a manganese availability index value of 110 in the equation below: (use Mehlich III extracted manganese values)

Manganese Availability Index ( $\text{MnAI}$ ) =  $101.7 - 15.2 (\text{pH}) + 3.75 \text{ Mn mg/kg}$

For optimum turfgrass performance, manganese and iron levels should be balanced at a ratio of 3:1 iron:manganese reported as Mehlich III extracted mg/kg. Although there has been no observed toxicity for manganese levels above the 30 – 45 ppm range reported in the guidelines below, excessive manganese application is not encouraged.

#### Guidelines

	Low	Normal	Excessive
Mehlich III SLAN	< 30 mg/kg	30 - 45 mg/kg	unknown
MnAI	< 110	> 110	unknown

#### Management

Manganese products that can be used to adjust soil manganese levels are listed below.

$\text{MnSO}_4 \cdot \text{H}_2\text{O}$  Manganese sulfate

Manganese sucrate Granusol manganese